

NP-33-98-012-01

Docket No. 50-346

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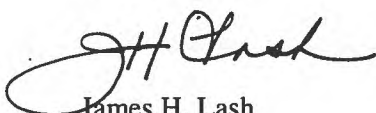
United States Nuclear Regulatory Commission  
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Ladies and Gentlemen:

LER 1998-012  
Davis-Besse Nuclear Power Station, Unit No. 1  
Date of Occurrence - October 18, 1998

Enclosed please find Revision 1 to Licensee Event Report (LER) 1998-012, which is being submitted to provide additional information regarding the subject occurrence. The changes are marked with a revision bar in the margin. Please destroy or mark superseded on previous copies of the LER. This LER is being submitted in accordance with 10CFR50.73(a)(2)(iv).

Very truly yours,

James H. Lash  
Plant Manager  
Davis-Besse Nuclear Power Station

GMW/s

Enclosure

cc: Mr. James E. Dyer  
Regional Administrator  
USNRC Region IIIMr. Kevin S. Zellers  
DB-1 NRC Senior Resident Inspector

Utility Radiological Safety Board

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## COMMITMENT LIST

THE FOLLOWING LIST IDENTIFIES THOSE ACTIONS COMMITTED TO BY DAVIS-BESSE NUCLEAR POWER STATION IN THIS DOCUMENT. ANY OTHER ACTIONS DISCUSSED IN THE SUBMITTAL REPRESENT INTENDED OR PLANNED ACTIONS BY DAVIS-BESSE. THEY ARE DESCRIBED ONLY AS INFORMATION AND ARE NOT REGULATORY COMMITMENTS. PLEASE NOTIFY THE MANAGER - REGULATORY AFFAIRS (419-321-8466) AT DAVIS-BESSE OF ANY QUESTIONS REGARDING THIS DOCUMENT OR ASSOCIATED REGULATORY COMMITMENTS.

<u>COMMITMENT</u>	<u>DUE DATE</u>
1. Revise procedure DB-OP-06901 to re-sequence the steps for taking ARTS out of MFP Bypass during plant startup. The new sequencing removes ARTS channel MFP half trip signals from each channel before rotating the TTBS. When a TTBS is rotated, any momentary interruption of the signal will only result in a half trip of the other three channels. This will also prevent an inadvertent trip of the ARTS should a TTBS not make-before-break.	1. Completed on October 10, 1998.
2. Install the missing wiring for the spare position of the ARTS Test Trip Bypass Switches.	2. Prior to startup from the Twelfth Refueling Outage, which is currently scheduled for Spring, 2000.



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TEXT CONTINUATION

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Davis-Besse Unit Number 1	05000346	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
		1998	-- 012 --	01	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Description of Occurrence:

At 2152 on October 18, 1998, with the plant in MODE 2, a reactor trip occurred from approximately four (4) percent power due to an Anticipatory Reactor Trip System (ARTS) signal. The ARTS signal was initiated while a control room operator was placing the ARTS channel 1 test trip bypass switch (TTBS) [Energy Industry Identification System Identifier HS] to normal after placing the number 2 Main Feed Pump (MFP) [SJ-P] in-service. This action completed the trip logic for ARTS channels 2, 3, and 4, resulting in a trip signal to three of the four control rod drive [AA-BKR] trip breakers. Initial notification of this reactor trip was made to the NRC at 2358 in accordance with the four-hour reporting requirements of 10CFR50.72(b)(2)(ii). This report is being submitted in accordance with 10CFR50.73(a)(2)(iv).

The design of the ARTS logic utilizes four redundant and independent sensor channels to monitor the two MFPs, the main turbine [TA] and the Steam and Feedwater Rupture Control System (SFRCS) [JB] for trip conditions. Each group of four sensing channels is connected to two-out-of-four logic gates by isolation devices. The output from these two-out-of-four logic gates is applied to the associated undervoltage coils for the control rod drive trip breakers and to the undervoltage relays for the shunt trip circuits for the control rod drive trip breakers.

Each MFP turbine is provided with four pressure sensors that monitor the MFP turbine hydraulic control oil pressure. Should both MFP turbines trip (indicating a loss of all main feedwater), the ARTS logic will trip the reactor and limit the Reactor Coolant System (RCS) [AB] pressure increase such that challenges to the Pilot Operated Relief Valve will be minimized. Associated with each of these MFP turbine oil pressure switches is a test toggle switch. The administratively controlled toggle switch simulates a trip condition to the logic when the respective MFP turbine is not tripped and not providing flow to the steam generator, such as during plant startup.

Each safety grade ARTS sensing and logic channel is provided with one key operated rotary test trip bypass switch (Grayhill Inc., Model Number 8L36-05-2-05S-F). This switch enables the operator to change the two-out-of-four logic into a two-out-of-three logic for one given variable.

The channel bypass permits the testing, calibration, and maintenance of a particular generating station variable, of a single channel, during power operation. With the bypass in effect, the three remaining channels of that station variable provide the necessary protection.

All four ARTS test trip bypass switches are placed in the MFP position during plant shutdown to allow both MFP Turbines to be tripped without tripping the reactor. Also, all four ARTS test trip bypass switches are placed in the MFP position during plant startup, which allows ARTS channels to be reset and control rod drive trip breakers to be closed. During startup, the switches are returned to the normal position after a MFP is placed in-service.



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Description of Occurrence: (continued)

On October 18, 1998, with the plant in Mode 2 at approximately two (2) percent power, a plant startup was in progress in accordance with Davis-Besse Nuclear Power Station (DBNPS) procedure DB-OP-06901, "Plant Startup." The control room operators were transitioning feedwater supply to the steam generators from the Motor Driven Feedwater Pump (MDFP) [SJ-P] to turbine driven MFP 2. Procedure DB-OP-06901 step 3.19 directs that a MFP be placed in service using main steam in accordance with DBNPS procedure DB-OP-06224, "Main Feed Pump and Turbine".

At 2109 hours the control room operators completed the start-up of MFP 2 through transferring speed control to the Integrated Control System [JA] in accordance with procedure DB-OP-06224. The next step to be completed in procedure DB-OP-06224 was the placement of the input test toggle switches for MFP 2 into the operate position for ARTS channels 1, 2, 3, and 4. The control room operators could not complete this step, as MFP 2 was not supplying feedwater to the steam generators [SG] as required by the step's prerequisite condition. The control room operators returned to procedure DB-OP-06901, step 3.20, to transfer feedwater supply from the MDFP to MFP 2. The MDFP was shutdown at 2123 hours, allowing MFP 2 to supply all the main feedwater to the steam generators in accordance with procedure DB-OP-06901. At 2144 hours reactor power was increased to approximately four (4) percent.

Step 3.21 of DB-OP-6901 requires that input test toggle switches for ARTS channels 1, 2, 3, and 4 are positioned appropriately for the existing plant conditions (i.e., the operate position for the in-service MFP and the trip position for the out of service MFP) and the test trip bypass switches placed in normal. These actions are performed and completed for each ARTS channel sequentially.

The control room operator was directed to perform step 3.21 of DB-OP-06901 concurrently with the placement of the MFP test toggle switches into the operate position as directed by DB-OP-06224. The operator proceeded to ARTS channel 1, placed the test toggle switch for MFP 2 into the operate position, and inadvertently rotated the TTBS key switch to the spare position, the correct position being normal. This action completed the trip logic for ARTS channels 2, 3, and 4 resulting in a trip signal to three of the four control rod drive trip breakers, causing the reactor trip at 2152 hours.

Apparent Cause of Occurrence:

At the start of the evolution to remove ARTS from MFP bypass, each ARTS channel has a half trip signal due to each channel's MFP input test toggle switches being in the trip position and each channel's TTBS being in the MFP position.

The steps in procedure DB-OP-06901 for removal of the MFP bypass were written, reviewed and approved based on the ARTS logic drawing. The drawing indicates that the MFP input signal and the TTBS input to an "or" gate to send either

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Apparent Cause of Occurrence: (continued)

signal to the other three ARTS channels. Therefore, per the drawing, once an ARTS channel MFP input test toggle is placed in the operate position for a reset MFP, the position of the TTBS in that channel is not relevant.

As part of the initial investigation, testing was performed on a spare TTBS. The results of this testing indicated that the transfer of the bypass signal to the other ARTS channels through the TTBS could have been intermittently interrupted before the MFP operating signal was established to the other ARTS channels. When the ARTS channel 1 TTBS was rotated from the bypass position, it was reasoned that there was a momentary interruption of the signal to the other three ARTS channels. Since ARTS channels 2, 3, and 4, already had a tripped signal present from their own MFP sensors, the two-out-of-four trip logic for each of the three channels was complete. This resulted in three of the four control rod drive trip breakers opening and the subsequent reactor trip.

During the initial investigation of this event, it was determined that the TTBS is designed to be a make-before-break switch. Testing performed on a spare TTBS revealed the switch contacts would occasionally not make-before-break. This determination was documented on Potential Condition Adverse to Quality Report (PCAQR) 1998-1996. At the time, the apparent cause of this event was believed to have been an undetermined failure mechanism of the channel 1 TTBS. Further troubleshooting revealed a similar problem with the ARTS channel 4 TTBS. The channel 4 TTBS was replaced, and the spare TTBS marked to prevent use in the plant.

Continued investigation during a scheduled plant shutdown on April 29, 1999, revealed a wire shown connected to the TTBS spare position in design drawings for all four channels of ARTS was not installed. This lack of connection caused trip signals to be sent from channel 1 to the other three channels when the control room operator inadvertently rotated the channel 1 TTBS to the spare position. In 1986, a plant modification (FCR 86-0289) was initiated to install these wires after it was discovered that the lack of wiring would result in a trip signal being transmitted to the other ARTS channels when the TTBS was rotated to the spare position. A plant modification was initiated in 1987 (87-1107) to change the design of the Steam Feedwater Rupture Control System (SFRCS) input to the ARTS. The 1987 modification planned on using the spare ARTS input logic circuits, so the 1986 modification was voided and the 1987 modification was revised to incorporate the intent of the 1986 modification. During development of the 1987 modification, it was decided not to change the SFRCS input to ARTS. Drawing changes were initiated to install the wiring as previously planned, but the wires were apparently never installed during implementation of the 1987 modification. This was apparently due to a lack of precise instructions in the maintenance work order package, an inadequate work order closeout review, and an inadequate post-modification installation circuit test.

The apparent cause of this event was the inadvertent rotation of the ARTS channel 1 TTBS to the spare position. This caused the de-energization of the

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Apparent Cause of Occurrence: (continued)

MFP bypass signal from ARTS channel 1 due to the lack of wiring connected at the spare position. In conjunction with the missing wire, the operating procedure allowed the TTBS to be rotated prior to removing the other three ARTS channels from a half-trip state.

Analysis of Occurrence:

There were no safety concerns identified during or as a result of this event. Three of the four control rod drive trip breakers opened as required and all control rods inserted on the reactor trip as designed. Steam Generator pressure increased (maximum pressure was 893 psig) as a result of the turbine bypass valves closing, but began to decrease approximately one minute after the reactor trip due to the low decay heat load and the secondary system steam demand. Steam generator pressure was stabilized at approximately 780 psig. There were no emergency core cooling system actuations and no safety relief valves lifted.

Corrective Actions:

Procedure DB-OP-06901 was revised on October 10, 1998, to re-sequence the steps for taking ARTS out of MFP Bypass during plant startup. The new sequencing removes ARTS channel MFP half trip signals from each channel before rotating the TTBS. When a TTBS is rotated, any momentary interruption of the signal will only result in a half trip of the other three channels. This will also prevent an inadvertent trip of the ARTS should a TTBS not make-before-break.

The missing wiring for the spare position of the ARTS Test Trip Bypass Switches will be installed prior to startup from the next refueling outage (12RFO), which is currently scheduled for Spring, 2000.

The present administrative procedures and processes at DBNPS related to the control of work were not in place in 1988 during implementation of plant modification 87-1107. Furthermore, the experience level of present test leaders has improved over the contractor personnel performing the post-modification installation circuit test in 1988. Therefore, no corrective actions are necessary related to the DBNPS administrative procedures and processes.

Failure Data:

Previous reactor trips involving actuation of ARTS were documented in DBNPS LERs 97-010 and 92-002, however, these events were initiated by plant components external to the ARTS, not from within the ARTS.

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PCAQR 1998-1891  
PCAQR 1998-1996



CATEGORY 1

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SUBJECT: Forwards LER 98-012-01, which is being submitted to provide addl info re 981018 occurrence. Commitment list attached.

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